Reciprocity

Volume XI Number 1 Spring 1981

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SIXTH ANNUAL NSA CONVENTION

DEI ROOM
ROCKWELL INTERNATIONAL DOWNEY FACILITY
12214 Lakewood Boulevard
Los Angeles, CA 90241
Friday & Saturday
August 14 & 15, 1981
9:00 a.m. - 5:00 p.m.

DEI denotes Design, Engineering and Inspection

DESIGN FOR A COHERENT UNIFIED ENGINEERING SCIENCE, the RECIPROCAL SYSTEM OF PHYSICAL THEORY, CREATED BY MR. D. B. LARSON, will be the best reason for being at the 1981 Annual Meeting of the non-profit educational corporation, presently known as New Science Advocates (NSA, INC). (Name change for the corporation will be considered at this Convention).

A preview of the scientific and philosophic quality of the discussion that will pervade the 1981 Corporation Convention can be discovered by inspecting and perusing the variety of original and pertinent essays in the present issue of RECIPROCITY, news organ of the Corporation. (Change of RECIPROCITY from an eleven-year young newsletter to a full-size journal will be considered at this Convention).

Arrangements have been made with Tahitian Village Manager, Mr. Bob Burns, 13535 Lakewood Boulevard at Rosecrans, Downey, CA 90242 to reserve 20 rooms for these two nights and these can be reserved for Thursday (August 13) arrivals. Cost for NSA attendees will be $28.00 and $32.00 per night, depending on single or double occupancy. Final arrangements must be made with Mr. Burns by the middle of July. His telephone number is (213) 634-4444.

Our California hosts, Hal Norris and Richard Long, have arranged for use of the Kona Kai room at the Tahitian Village for the corporation's main public meeting and Dewey B. Larson's Principal Lecture on Friday evening. Social hour with no-host bar will start at 6:00 p.m. with dinner at 7:00 p.m. and the meeting to start at 8:00 p.m.

The dinner will be a sit-down affair with prime rib (Menu No. 8, $8.25 plus Tax and Tip) as the main course. The Arrangements Committee also chose strawberry shortcake for the dessert and asparagus for the vegetable.

More about 1981 Convention and CALL FOR PAPERS ON page 27.

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Date: Nov. 1, 1979

Dr. W. R. Lucas
Director, Marshall Space Flight Center
Huntsville, ALA 35812

Dear Bill,

In this letter I will try to bring a new theory in focus concerning especially the far out areas of natural science and to stimulate early assessment of its consequences.

My work in utilizing zero g for processing led me to find out more about gravitation. Now, after 20 years of follow-up, it has become clear that all the answers are available through Dewey B. Larson's Reciprocal System of Theory. All observed physical and chemical features in our real universe coincide with Larson's theoretical universe of motion and which has many more not yet observed features, but since first published in 59, some of these theoretical features like quasars and pulsars, cosmic elements known as mesons and hyperons, neutral currents and atomic interactions, have been observed, while others still must be discovered. In the late sixties, I often referred to the gravity dominating all our processes as being a property of earth and we now can control this terrestrial environment by simply going away in a rocket. Some of my colleagues told me that I talked like Larson. I started to read his books, but his radical departure from present theories and his development of thought from such a drastic reconstruction of fundamentals made it extremely hard and time-consuming to comprehend, at least part of it. The reason, as I know now, was that he worked for 30 years intensively, ending up with that one fundamental postulate which determines the whole physical universe, and the reader must start with it and work his way backward until he finds an interface with his established experience and starts to trust the strange new thing.

Later I asked Larson how he could have invented such a thing without God's help and he said it was definitely not a revelation and more so, not an invention, but hard and often frustrating work of exploration. He started 50 years ago relating properties of the chemical elements from their position in the Periodic Table. Following the prevailing scientific thought, he was accounting as well for the variations of number and arrangement of subatomic particles. Success of his formulation started from introducing differences in the motions of the constituent subatomic particles rather than composition. Finally only the motion terms had to be retained arriving at a mathematical expression for the interatomic distance in the solid state in terms of just three variables clearly related to the Periodic Table. He told me

that the proper conceptual interpretation of the physical meaning of such a surprisingly simple result was a rather discouraging phase within the first 20 years of his work. Eventually it became clear that the atom could consist of nothing more but a combination of motions itself, oriented about three axes, and a general reciprocal relationship within the space and time components of these motions related to the atomic number of each element.

The understanding emerged that the atom is formed from units of motion in linear vibration and rotating, forming a disc, which rotates forming a sphere, which can carry rotational vibrations which are the charges.

He successfully extended his inter-atomic force equation and calculated thousands of examples for chemical compounds; including distances between atoms in complex crystals, specific volumes, cohesion, melting points, compressibility, and deduced a liquid state theory deriving density, viscosity, surface tension, valences and so on from the chemical compositions. Application of this knowledge will yield the capability of analyzing theoretically zero-q effects on supercooling, stability of immiscible liquid systems, crystal formation, amorphous solidification, wetting and so on.

While the concept of a universe of motion is by no means new, Larson's break through to a usable theory comes from an absolutely consequent and phantasyless development of motion as being nothing more but the reciprocal relation between progression in space and progression in time. There exists nothing more but

- o <u>vectorial motion</u>, like Translation away or towards each other,
  Rotation clock-or counterclockwise
  Linear Vibrations
  Rotational Vibrations

- O <u>scalar motion</u>, outward or inward

Space and time are consequences of motion and nothing more, no preconceived space and time in which the old science has placed the universe, making them a nonphysical background and unrelated to each other.

The result is a purely theoretical, completely inflexible structure, having particular properties like matter, radiation, gravitation, electric and magnetic phenomena and so on through a complete material and cosmic-material cycle that must exist and must follow specific physical and chemical behavior patterns.

The astounding thing is only that this fits our real universe so good. It turns out that the physical constants like Boltzmann's constant, Planck's constant, gravitational constant and so on are all conversion factors from the natural space and time units to the arbitrary c.g.s. units.

The simplest entity is radiation, there linear vibrating motion units (photons) are stationary in the natural reference system, but the reference system moves with one unit of space progression per one unit

of time progression. Thus unit velocity is the speed of light. From this the two sectors of the universe extend, the material sector into the below unit speed region, the cosmic material sector into the above unit speed region. Matter forms by rotation of vibrating units (photons) about three axes. While the reference motion is away from each other in all directions (scalar) as seen at the photons emitted from a light bulb, the rotation moves matter towards each other (scalar). This is gravitation. The gravitational speed is a square function of the distance to the other matter. The net gravitational motion is the sum of the natural outward and gravitational inward motions. There are three cases: first, the net motion is toward each other as observed by Newton: secondly, the net motion is zero, (Gravitational Limit), as observed in star clusters; thirdly, the net motion is away from each other as observed at the recession of galaxies. This extended Newton's Law tells us also about the distance requirement between stars and the size limits of galaxies, but it is basically not different from the inter-atomic-force equation.

This example shows that Larson arrives at the same conclusion as conventional theory plus extension into heretofore inaccessible ranges. Present theory is mathematically fitting each department separately but contradicting each other in the fringe areas because the common denominator is not there and which Larson obviously has discovered. No more than five percent of conventional thought has to undergo significant change and these reconstructions are confined to the far out regions: the very small; the very large; the very fast; and the very far. It is therefore of NASA's concern to look at it not in a defensive way like once the church towards Copernicus, but quickly check out with the right people whether they really have something.

Since 1971 a loosely knit group of interested people has formed, discussing the Reciprocal System and reporting advances in the paper, RECIPROCITY of their organization, the New Science Advocates (NSA). With their help, Larson is rewriting and extending his first book "The Structure of the Physical Universe", which was sold out since sometime. The first volume "Nothing But Motion", is usable as a textbook, it was released last month. I had 20 copies but not many left ($9.50). Annual meetings of the NSA have been held - 1976 at the University of Minnesota, 77 at U of Mississippi, 78 at U of Utah, 79 at U of Wisconsin-Superior. Now, Dr. Frank Anderson, Chairman, Dept. of Chemical Engineering, U Miss and Prof. Frank Meyer, Physics Dept, U Wisconsin, have asked me whether the meeting could be next year in Huntsville. It was always a over-the-seekend affair, because it is all voluntary. This would be a good chance to get specific answers in areas of interest from the right people. For instance, even if the results of space mission experiments are without any doubt mathematically correct, the meaning and consequence might be open. If the investigators can list such areas, I could forward this to NSA members and they can address it at the meeting here. Also Larson could be a speaker at one of your seminars. He is eighty years old, son of Norwegian immigrants from Dakota, now living in Portland, Oregon. I have never before seen anybody with such an independent and absolute logic.

There should be many more significant answers in the experimental results that presently nobody is asking for. The Reciprocal System

tells us as much about the cosmic sector as we know about the material sector we are living in. We know that exploding star material is partly disappearing (black holes?), appearing as "Material Rays" in the cosmic sector, rearranging itself into the cosmic elements (inversed space and time units distribution of our Periodic Table). Then, the cosmic galaxies reach their destructive limit and explode, appearing as "Cosmic Material Rays" in our sector, rearranging itself into the material elements.... and so on, a steady state universe. After all of the material does not leave only the heavy elements, there should be a classification by the old recycled and the newly formed material possible. A different look at the Skylab solar experiments might reveal a much different process as presently anticipated. For instance Prof. Meyer with a group of grad. students recalculated the magnitude of Mercury's perihelion precession requireing a mathematically very simple correction for the coordinate time change by Larson's theory. Einstein assumed an increase in mass of the planet at the higher orbital velocity at perihelion, needing 75 rather complicated equations. Both results are close to the measurements, only a variation of mass contradicts Einstein's $E=mc^2$, while the coordinate time applies in any field of physics and chemistry. As already mentioned, the liquid state theory offers much.

Giving the Reciprocal System of Theory a fair chance requires a change in thinking, something that the human mind almost automatically resists and generally resents. It is evident that any activity must be slowly and carefully brought under way. Needed in first place is your acceptance and blessing. One can naturally in a letter give little to find your ear and I am happy to try to answer any more questions, just call or involve me in a discussion with colleagues. Larson has been with high interest discussed by many coworkers in the past, I remember Reinfurth, Wilhold and Jess Jones, they also have the new textbook.

Cordially yours,

Hans

P.S. A philosophically interesting point is that the Reciprocal Theory limits the physical universe clearly to a specific mechanical capacity. There is no open end for eventually explaining our total existence if the computers get big enough. Interesting interfaces also emerge with respect to life systems.

HANS WUENSCHER, NSA LEADER

Every person is a whole world in himself or herself. When a person dies, the whole world does not die with his death. Hans Wuenscher, a valued leader of our movement, has died in the flesh. Our corporation shall sorely miss his living council. His spirit is not destroyed and will continue to serve us and humankind.

Hans did the best work of his life in the Marshall Space Flight Center under the leadership of his friend and teacher, Wernher von Braun. Let Dr. Braun write Hans's epitaph:

> "Nature does not know extinction; all it knows is transformation. Everything science has taught me strengthens my belief in the continuity of our spiritual existence after death."

(Clough) "It fortifies my soul to know
That, though I wander, Truth is so".

SOME COMMENTS ON SATZ'S PAPER

by K.V.K. Nehru

I am setting down below some issues requiring clarification that arose on reading the excellent paper on 'Further Mathematics of the Reciprocal System' by R. W. Satz (RECIPROCITY, p. 4-15, Vol. X, No. 3). Such type of difficulties may well be experienced by other lone amateurs like me. (I will refer to NOTHING BUT MOTION as NBM and QUASARS AND PULSARS as QP.)

1. One of the most serious difficulties that besets a beginner is the occurrence of uncorrected typographical errors, especially in the mathematical expressions. The reader who has been following the development thus far, racks his brain to comprehend this pseudo-difficulty, as he is treading an utterly unfamiliar ground. A veteran may not feel this, however. Some such errors of omission and commission I find are:

1.1. A general confusion resulting from the use of 1/2R to mean (1/2)R at some places and 1/(2R) at other places (as in line 16, p. 8).

1.2. Lines 12-13, p. 5: Instead of "...natural unit velocity..." it must be "...natural unit of velocity..."

1.3. Line 9, p. 6: In the equation "$s_{nat} = 2 \times s_{nat} \times f_{os\ nat}$" the L.H.S. should be "$s_{nat}/t_{nat}$."

1.4. Line 4, p. 7: 'x' is missing inside the parentheses in the R.H.S. of the equation.

1.5. Line 3 below the Table, p. 9: Instead of the words "1 or more," it should be "more than 1."

1.6. Line 2 from bottom, p. 9: Instead of "1/2 - 1/2 - 2," it must be "1/3 - 1/2 - 2."

1.7. Line 1 in the Table, p. 10: Under 'Rot. Freq.' it should be $2R/3\pi$ instead of $2R/\pi$.

1.8. Line 2 in the Table, p. 10: Under 'Photon Frequency' it must be $\frac{1}{2}R$ and not 2R.

1.9. 2nd Table, p. 10: Under 'Rot. Displ.' for Deuterium, it must be "(1)" and not "1" in the electric dimension.

2. The next type of difficulty arises out of the failure to define new symbols, terms or ways of representation when used the first time in the text. Examples are:

2.1. Use of letter R to represent the Rydberg frequency in p. 7, without priorly defining. R should have been defined in p. 6 itself where Rydberg frequency is first mentioned: instead, it is done later, on p. 8.

2.2. Line 3, p. 11: What is meant by the 'relative rotations' is not clear.

2.3. A new notation, differing from that adopted in NBM, is used to represent the rotational displacements of the double rotating systems of the atoms. Especially the discrepency in the number of electric displacement units among the two notations is not made clear. For example, lithium is represented by $\begin{matrix}2\text{-}1\\2\text{-}1\end{matrix}>1$ whereas it should be $\begin{matrix}2\text{-}1\text{-}1\\2\text{-}1\text{-}1\end{matrix}$) or $\begin{matrix}2\text{-}1\\2\text{-}1\end{matrix}>2$ from NBM.

2.4. Lines 1-2, p. 13: How this bond gives rise to an electric speed of 1/10 for vibration one ... etc. is not clear. What is meant by the 'Active Dimension' in the Tables in p. 13 and 14 (which even takes on a value of 1½ etc.)? These gaps in the explanation could not be made good by referring to NBM either (as the author suggests at the outset).

3. The last type of difficulty is conceptual:

3.1. "... the oscillation takes place over one natural space unit" (line 6 from bottom, p. 5). Does the oscillation take place over a space unit in all cases? In the case of high frequency radiation, say of frequency n (where n is an integer), the greater than 1 space-time ratio is accomplished by the periodic scalar reversal of the time component. What is oscillating, therefore, is the time component, while the space component is progressing unidirectionally. Hence what we have to consider here is a sine curve in three-dimensional time. (See lines 8-5 from bottom, p. 29, QP.) As such, the Eq. (18) in p. 7 is applicable only to low frequency radiation (with frequency = 1/n).

The equation for a simple harmonic oscillation in one dimension (say the T direction) of time is

$$T = \tfrac{1}{2}\, t_{nat} \cdot \sin\left[-n\pi t/t_{nat}\right]$$

which can be derived like the Eq. (18).

3.2. "The diameter of all the particles is one natural space unit, reduced by the interregional ratio, or 2.914 Å." (lines 4-5, below the Table, p. 9).

But to me it appears that the interregional ratio applicable here is not 156.44. For, see for example, "...each of the rotating systems of the atom has an initial unit of vibrational displacement with three possible orientations, one in each dimension. For the two-dimensional basic rotation this means nine possible positions, of which two are occupied." (p. 154, NBM) Hence the additional 2/9 factor is 128(1 + 2/9). But in the case of subatomic particles, since they are only single rotating systems, of the nine possible vibrational positions, only one is occupied and so the interregional ratio ought to be 128(1 + 1/9) = 142.22. This gives the diameter of the particle as 3.2054 Å while that of an atom is 2.914 Å.

SOME THOUGHTS ON THE RECIPROCAL SYSTEM OF THEORY

Under this heading Professor K.V.K. Nehru has raised some interesting questions and made some perceptive comments about D. B. Larson's NOTHING BUT MOTION, referred to by Dr. Nehru as NBM and NEW LIGHT ON SPACE AND TIME, referred to by Dr. Nehru as NLOSAT. These questions and comments are reproduced below, interspersed with responses by the creator of the Reciprocal System, who refers to the second book by ST and the first book by M.

(1) K.V.K.: p. 156, 13th line from bottom, NLOSAT: Instead of the words 'basic vibrating unit' it must be 'rotational base.'

p. 123, 10th line from bottom, NBM: in 'However, the rotational displacement...,' the word 'rotational' should be replaced by 'vibrational.'

(1) D.B.L.: You are right on both of these items. I have expressed the first one in the correct manner on page 140 M.

(2) K.V.K.: There is a difference in the notations used for representing the rotations of atoms (e.g.: 2-1-0, p. 236, NLOSAT) and of the sub-atomic particles (e.g.: 1-0-(1)). In the former the numbers represent double natural units whereas in the latter they represent single natural units. This divergence is a source of confusion as no attempt was made to clarify it, and both modes of notation were used at the same places, as in p. 236, NLOSAT.

(2) D.B.L.: I gave a brief explanation on page 231 ST, but this book is, as I said in the preface, a "bird's eye view," and I could not go into much detail on anything. There is a more extended explanation on page 140 M, including setting up a new system of notation to avoid the difficulty that you point out. I do not believe it advisable to try to use the same notation for both atoms and sub-atomic particles, as this would lead to complications in the development of theory.

(3) K.V.K.: p. 170, last but one para, NLOSAT: It is not clear how a proton, M 1-1-(1), can acquire a positive electric charge (see p. 145, NBM). From what has been explained in the para cited above and elsewhere, as its electric rotational displacement is space-like, the proton can only acquire a negative electric charge--like the electron.

(3) D.B.L.: An electric charge is a one-dimensional rotational vibration. In order to be stable and identifiable as a separate entity it must oppose the rotation with which it is associated, but this does not have to be the rotation in the electric dimension. The charge can oppose the rotation in one of the magnetic dimensions. Since the magnetic rotation is always positive in the material sector, this means that all material elements can take positive electric charges under appropriate conditions. In fact, at high temperatures, such as those in the stars, all elements are positively charged.

(4) K.V.K.: In p. 155-6, NLOSAT, the apparent reduction in the velocity of light in a material medium is attributed to the additional space involved due to the rotational space-like displacements included in the structure of most atoms of matter. On this score, the apparent velocity of light in a material medium with only positive rotational displacements should be greater than c!

(4) D.B.L.: I am not quite clear as to the point of your comment. I will say, however, that ordinary matter is a time structure; that is, one in which n units of time are associated with each unit of space (as we see the situation in the context of the conventional fixed system of reference). When the photon passes through this matter, the total time involved in the motion is increased by the addition of the time component of this matter. The photon speed, the ratio of space to time, therefore decreases. Conversely, in the cosmic sector, where matter is a space structure, the speed of light is increased in passing through cosmic matter.

(5) K.V.K.: Speaking of the progression of the photon in the free dimension it is remarked that "..the combination of a vibratory motion and a linear motion perpendicular to the line of vibration results in a path which has the form of a sine curve." (p. 51, NBM) In the case of HF radiation, the space component of the vibration progresses unidirectionally while it is the time component that oscillates back and forth. As such "the linear motion perpendicular to the line of vibration' referred to above cannot be the scalar progression of the space component of the general space-time progression. Is the sine curve form, then, taken to be pertaining to the three-dimensional time?

(5) D.B.L.: The frequency of the radiation is irrelevant. In either case, HF or LF, the progression of the natural reference system in the dimension of the vibration is neutralized by the reversals. This permits a progression to take place in a perpendicular dimension. The scalar motion (progression) in this second dimension is totally independent of that in the first, as scalar quantities cannot be combined vectorially.

(6) K.V.K.: Explaining the effect of adding rotation to the vibrational units of a photon, it is said that the "remaining vibrational units of the original photon continue as a photon of lower displacement" (p. 123, 3rd para, NBM). But it is not clear how the detachment of one of the vibrational units (which are any way discrete) reduce the displacement of the original photon?

(6) D.B.L.: The units that I am talking about here are units of displacement -- that is, units of speed. (See explanation of the use of the term "displacement" on pages 119-121 M.) When one unit is detached to join the rotational motion, the photon continues on its way with one less unit of speed (a lower frequency).

(7) K.V.K.: The liquid state is the result of vanishing of the force of cohesion in one dimension (and the gaseous state in three dimensions). However, whether the vanishing of the cohesion in two dimensions results in any specifically observable distinction is not made clear. Is it to be equated to the vapor state?

(7) D.B.L.: Probably. I had not covered this subject fully twenty years ago when I interrupted my research work in order to start publication of my results, and I have not been able to get back to it since. My conclusions in this area are therefore somewhat tentative.

(8) K.V.K.: p. 173, top para, NLOSAT: Not only this--if the hypothesis of the tendency of atoms to assume a stabler structure like that of inert gases by gaining an electron is true, should not the atoms, say, of chlorine, tend to transform to those of argon, if placed in an environment of negative electrons, by absorbing single electrons?

(8) D.B.L.: It looks that way to me, too, but I suppose we will have to let the supporters of conventional theory answer this question.

(9) K.V.K.: p. 50, bottom para, NBM: It is not clear why do the inward/outward scalar reversals result in vectorial direction reversal in only one dimension? Why they do not produce a three- or two-dimensional vibrating unit?

(9) D.B.L.: We are dealing with a scalar motion, and the only latitude that we have, at this stage of the step-by-step development, is to change from + to -, and vice versa. This does not necessarily preclude introducing additional dimensions of motion later in the development, but multi-dimensional scalar motion has some unfamiliar features. I intend to discuss this type of motion at considerable length in Volume II.

(10) K.V.K.: p. 185-6, NLOSAT: In view of the dimensional differences in the origin of electrical, magnetic and gravitational forces which are actually motions of the same general nature, it is shown that the force exerted by an electric charge on an uncharged mass is only $1/c^2$ as great as the force on an object with a charge of comparable magnitude. However, no mention is made of the force exerted by the electric charge on a magnetic charge, which, though it must be less than the force of an electric charge on electric charge, must, nonetheless, be greater than the force exerted by electric charge on uncharged mass. Hence this must be within the possibility of detection, like the weak force exerted by a magnetic charge (referred to in the para cited) on a (magnetically uncharged) mass unit.

(10) D.B.L.: I have not arrived at a firm conclusion on this point as yet. It had occurred to me, and I have given it some consideration. So far, I am inclined to believe that it will be ruled out by the directional orientation of the electric and magnetic forces.

(11) K.V.K.: Within the gravitational limit of a material aggregate there is net inward scalar motion. As such, what would happen to a photon emitted from the object, within the gravitational limit? As the photon has no independent motion but is only carried away by the general space-time progression and since the net motion now is inward, how can we account for the velocity, c, of the photon and its eventual emergence from the domain of the gravitational limit?

I think, the argument that the above net inward motion within the gravitational limit belongs only to the material aggregate and does affect the photon is not valid. Even if such an argument is preferred, it raises another difficulty: how to account for the bending of light rays in a gravitational field gradient.

(11) D.B.L.:

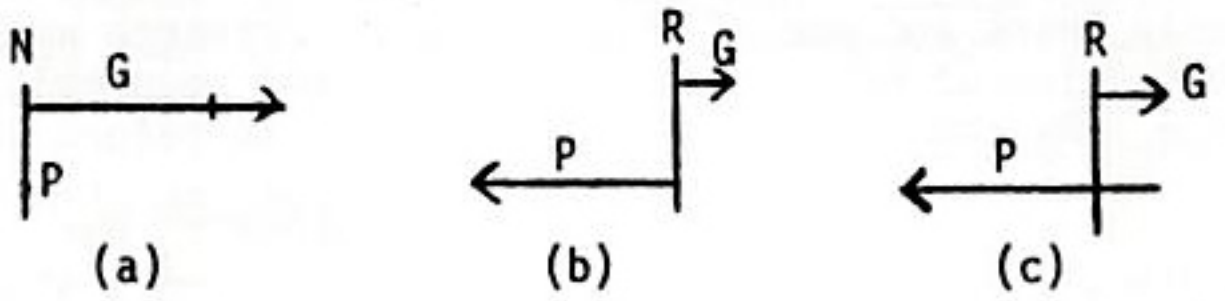


Diagram (a) shows how the photon motion P and gravitation G, without any modifying influences, would look relative to the natural reference system. The photon is motionless, while

gravitation has an inward speed 1+x. Diagram (b) shows the same situation relative to the conventional fixed reference system. Now the photon has an outward speed 1, while the inward gravitational speed has been reduced to x. Diagram (c) shows the usual situation encountered in practice. The gravitational speed x has been modified slightly by random motion, and now has a magnitude y, still very small compared to 1. A photon emitted from the gravitating object moves outward from that object at unit speed.

(12) K.V.K.: The mass-less sub-atomic particles do not have net time-like displacement in three-dimensions like the atoms. As such why are they not carried away by the general space-time progression since inward gravitational motion is not present to counteract the outward scalar progression? Doubtless, they differ from the photons thus carried away by the space-time progression in having additionally rotational displacements. But so long as the net rotational displacement is in less than three dimensions, the space-time progression should carry it off in the free dimension. Perhaps this could be the reason that this class of sub-atomic particles is not observed (p. 142, NBM).

It is put forward that the uncharged electron, for example, cannot move through space as its net displacement is space-like and the relation of space to space is not motion. However, since the one unit of two-dimensional rotation is balanced by the unit of negative vibration, and the net space-like rotation is only in electric dimension, is there no dimension effectively free so that the scalar space-time progression applies in that dimension?

(12) D.B.L.: These massless particles undoubtedly move at the speed of light, as you suggest. Our inability to observe them is not due to their speed, but to the fact that, except in the case of the neutrino, we have not, thus far, identified processes in which they take part. Experience with the neutrino suggests that some of the effects of the other massless particles may also be detectable is we look in the right places.

(13) K.V.K.: Instead of a RV displacement being added to an existing rotational displacement as in the case of atoms, is it possible to have a rotational vibration (of opposite space-time character) directly added to the linear vibrating unit that is photon? For example, a negative electric charge, RV^{1-}, can be imposed on a photon, LV^{1+}?

(13) D.B.L.: No. A charge is a rotational vibration. As such, it can only exist as a modifier of a rotation. Otherwise there would be nothing to constrain it into the rotational path, and it would revert to the status of a linear vibration.

(14) K.V.K.: Chapter 13, NLOSAT: The discussion does not bring out some important aspects of the difference in the characteristics of electric and magnetic charges compared to those of gravitation.

Firstly: Like electric charges repel each other and unlike charges attract. In order to explain this, should it be taken that the scalar effect of the charge is both inward and outward in space-time at the same time?

Secondly: The gravitational force, unlike that due to charges cannot be screened off (p. 60, line 3, NBM) because

gravitational motion is inward scalar motion with respect to the general structure of space-time. Now if, the motion which gives rise to the electric or magnetic forces is a motion of the same general nature as that of gravitation, being the motion of the individual atom or particle with respect to the general structure of space-time (p. 186, NLOSAT), it is difficult to see how these forces can be screened off as is possible actually.

As regards the first point the following line of explanation may be considered. The negative electric charge, being a time-like RV displacement, must have an attendent scalar translational motion in space (just like the gravitational motion of a positive rotation). Like the positive rotation, it may appear, that this RV displacement should therefore involve a scalar inward motion in space. However, "... because of its vibrational character each unit of this charge is only half as effective as a unit of unidirectional rotation." (p. 190, NLOSAT) Consequently, this accompanying scalar translational motion is midway between the general outward space-time progression and the inward scalar translational motion of a rotational unit. Thus it appears as a scalar outward motion in space from the point of view of the gravitationally-bound stationary reference system. This manifests as mutual repulsion between the negative electric charges.

On the other hand, the rotational vibration that is a positive electric charge, is a space-like RV displacement. Hence it involves a scalar translational effect similar to that of a unidirectional rotation that is space-like (motion in time). But the scalar translational motion of space-like rotational displacement units (i.e., rotation in time) is the gravitation in time. As such the space-like RV displacement too involves a scalar inward motion in time. Once again, as in the previous case, because of the fact that the vibrational rotation is only half as effective as a unidirectional rotation, this attendent scalar inward motion in time of a positive electric charge falls midway between the general outward space-time progression and the inward gravitational motion in time. Now, in order to understand how this appears from the point of view of the stationary spatial reference system, we must recall that in the context of such a reference system, the progression of the time component is the same as that in the natural reference system. Consequently, the scalar translational motion of the positive electric charge is apparent as inward in time. This manifests itself to us as mutual repulsion of the positive charges, since the inward scalar motion in time is tantamount to outward scalar motion in space.

Finally, the relationship of negative to positive electric charges is that of scalar outward motion in space to scalar inward motion in time and manifests to us as mutual attraction of the positive and negative electric charges.

Regarding the possibility of screening off the electrical charge effects: once we see them as basically scalar motions of the individual charges, screening becomes impossible, like in the case of gravitation. The following interpretation may be relevant. The screening is a balancing of the inward (or outward, as the case may be) scalar motion by a vectorial motion (i.e., 'co-ordinate' as versus 'clock' motion) in the dimension (or dimensions) concerned, by the screening object. This characteristic of the screen, the generation of motion oppositely directed to that of the scalar translational effect of the charge is not unlike the process of acquisition of gravitational charges due to captured charged neutrinos.

As given, since "... the natural unit equivalent of a magnetic (2-dimensional) displacement n is $4n^2$ ...," i.e., $(2n)^2$, the natural unit equivalent of a magnetic displacement unit of 1 is $2^2 = 4$, and in equivalent electric units is $4/2 = 2$ (in view of the double units we are working with). On the other hand, the natural unit equivalent of the magnetic displacement unit of $\sqrt{1}$ is $(\sqrt{2})^2 = 2$, and in equivalent electric units is $2/2 = 1$. Thus, while it does not seem to matter, at unit level, whether we consider the first unit of magnetic displacement as 1 or $\sqrt{1}$, only the latter is actually relevant, since this alone gives us the correct atomic number sequence.

This important point is not brought out in the discussion and the whole issue is glossed over with nothing more than one sentence, "At the unit level dimensional differences have no numerical effect, i.e., $1^3 = 1^2 = 1$." (p. 128, NBM)

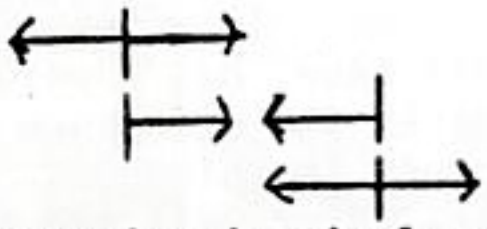
Indeed, the role of unity, as a natural datum, is of far-reaching significance. The requirement of the first effective unit of the 2-dimensional displacement being $\sqrt{1}$ instead of 1 can be seen to be arising out of the following. The first unit of displacement, from the rotational base, has a unique and distinguishing characteristic in that it marks the emergence of "something physical compared to the prevenient "nothingness." Inasmuch as this is so, the difference between the first unit and the rest is not only one of degree--but something else too. The adding of the first displacement unit involves a transit from the region inside the unit displacement to that outside. Hence the dictum that "... all of the physical phenomena of the inside region ... are ... second power expressions of the corresponding quantities of the outside region" (p. 155, NBM) applies here. Consequently, the 1 unit displacement, when looked from the viewpoint of physical manifestation--i.e., from the "something's" side of the unit boundary as against the "nothings's" side--is to be regarded as $\sqrt{1}$.

It must be noted that the setting up of units and measurement procedures from the standpoint of natural reference system, in terms of speed displacements, results in the relation between the algebra of displacements and the algebra of the conventional speed units being exponential in nature. This is to say that the adding of displacements is equivalent to the multiplying of the corresponding speeds.

Suppose we define the speed displacement d, of a speed v, as $d = \lg c - \lg v$, since it is a deviation from the unit speed, c; all speeds like 1/n give positive displacements, $\lg n$, while speeds like n give negative displacements, $-\lg n$, and unit speed c gives zero displacement, $\lg 1$. Though this definition does not exactly tie in with the treatment in the book, it, nonetheless, serves to demonstrate the general exponential nature of the relationship mentioned above. It also illustrates how the adding of a motion of (n-1) positive displacement units to another of (n-1) negative displacement units produces zero displacement (p. 121, NBM), since in dealing with the corresponding speeds we need to multiply the speed n (represented by (n-1) negative displacement units) by speed 1/n ((n-1) positive displacement units) to obtain the unit speed (zero displacement).

(14) D.B.L.: Your criticism of the lack of coverage of electricity and magnetism is valid, but here again you should bear in mind that a "bird's eye view" does not see everything. I will give you a much broader view of these subjects in Volume II of the new edition.

As brought out in Volume I (particularly in Chapter 18), linear motion is limited to two full units, from +1 to -1, as seen in our fixed reference system. In terms of the natural reference system both +1 and -1 are zero, the + zero and the - zero, we may say, if we look at the situation from the standpoint of what is happening in the region between the two. The motion of an electric charge is always outward, but the motion of a positive charge is outward from the positive zero, while that of a negative charge is outward from the negative zero. Two positive charges move away from each other, as shown in the upper line of the diagram below. Two negative charges also move outward away from each other, as shown in the lower line. But a positive charge and a negative charge move toward each other, as indicated by the middle line, even though they are both moving outward from their respective zero points.



Screening is simply a matter of mathematics. A+B is always greater than A, but A-B can take any value. Since all gravitational motion is in the same direction, the effect of introducing matter between objects X and Y is to increase the original gravitational motion A to A+B. But since the motion of charges can take either direction, the introduction of matter between charges X and Y may have a resultant A-B.

(15) K.V.K.: Regarding the lifetimes of the cosmic decay particles (Ch. 15, NBM) the following points may be considered. The spatial extension of the cosmic atom is the analog of the lifetime of the atom in the material sector. As such the lifetimes of the decaying c-atoms must bear a relation to their spatial extensions before the decay.

The correlation of lifetimes with the dimensions shown in p. 192, (NBM), can be arrived at by tying together some loose/ends as below (with appropriate interchange of the words 'space' and 'time'):

(i) The limiting spatial extension of the incoming atom in each dimension is one natural unit (i.e., s in conventional units). Thus the extension space involved in two dimensions becomes s^2, and in three dimensions, s^3.

(ii) The temporal equivalent of this spatial extension s is s/c.

(iii) "...If the motion is one-dimensional, all of the effects can be transmitted. If it is two-dimensional, the fraction transmitted .., is 1/c of the total ... The transmitted fraction is only $1/c^2$ in the case of three-dimensional rotation." (p. 185, NLOSAT)

(iv) "...The time region speed, and all quantities derived therefrom, which means all of the physical phenomena of the inside region .. are .. second power expressions of the corresponding quantities of the outside region." (p. 155, NBM)

The Table below shows the result of applying these criteria (i) to (iv) above to the various dimensional motions.

Criterion No.	Number of dimensions		
	1	2	3
(i)	s	s^2	s^3
(ii)	s/c	s^2/c	s^3/c
(iii)	(s/c)	$(s^2/c)(1/e)$	$(s^3/c)(1/c^2)$
(iv)	$\sqrt{(s/c)}$	$\sqrt{s^2/c)(1/c)}$	$\sqrt{(s^3/c)(1/c^2)}$
Result converted to secs.	1.233148×10^{-8}	1.520655×10^{-16}	1.875193×10^{-24}

On the other hand, if the extension space involved in the two- and three-dimensional cases are respectively $\frac{\pi}{4}s^2$ and $\frac{\pi}{6}s^3$ (based on statistical circular and spherical symmetry in co-ordinate space) instead of s^2 and s^3, we have the calculated values of the lifetimes in the two- and three-dimensional situations as respectively 1.347645×10^{-16} and 1.356892×10^{-24} seconds.

(15) D.B.L.: You may have something here. I do not have time to make a full evaluation of your proposal now. In fact, I have a general policy of not making a quick decision on any new idea, whether it is my own or comes from someone else. But it appears to me that this may be the kind of a thing that I was looking for (unsuccessfully) at the time I wrote Chapter 15. I suggest that you prepare a paper on this subject and send it to Professor Meyer for publication in Reciprocity, so that the NSA members can take a look at it.

(16) K.V.K.: The general space-time progression of our universe is an outward scalar progression. How is this to be distinguished from one with both space and time progressing inward? The universe of motion with both space and time progressing outward is indistinguishable from that with both space and time progressing inward. In addition, both these cases are indistinguishable from a third case where for one unit both space and time progress outward and in the next unit both of them progress inward, alternately. It is not clear how this indistinguishability is built into the conceptual framework of the Theory. Moreover, how (or whether) our consciousness has come to regard it as an outward progression is not evident.

(16) D.B.L.: The existence of a physical universe is possible only if gravitation is inward, so that the originally widely dispersed units of matter move closer together and eventually reach positions in which they can interact. This means that the arbitrary fixed reference system that we set up on the basis of such interactions is moving inward relative to the natural reference system. The apparent progression of the natural reference system is therefore outward.

(17) K.V.K.: "... deviations from unit speed .. are accomplished by means of reversals of the direction of the progression of either space or time." (p. 75, NBM) What about the case of conjoint reversals of both space and time, like: $\frac{-s}{+t}, \frac{+s}{-t}, \frac{-s}{+t}$ ... etc.? That is, for one unit space progresses inward while time progresses outward. In the next unit space progresses outward and time progresses inward. Such a basic motion has a speed of -1 that is unvarying and must be both an independent and a stable motion. Can we identify the above 'coupled-vibration' with any physical entity? The above may even result in rotation. At any rate, the motion is similar to the inward translational aspect of the material gravitation.

(17) D.B.L.: A speed of unity, 1/1, is no motion at all relative to the natural system. We cannot distinguish between no motion in space and no motion in time.

(18) K.V.K.: I find that the following concepts are not explained adequately, with the result the reader (who is being exposed the first time) is left with many nagging why and hows:

(a) the inter-regional ratio (p. 154, NBM)
(b) secondary mass (p. 161, NBM)
(c) electric mass and mass of electric charge (p. 163, NBM)
(d) secondary neutral valence

(18) D.B.L.: I am not sure just what you have in mind here. Are you merely suggesting that I should explain these points more fully in later publications? (in which case, I thank you for the suggestion), or do you have some questions that you want answered? (in which case I would like to have something more specific).

(19) K.V.K.: p. 100, NBM: Continuing the line of argument (in the text), if we substitute an object with a speed less than c for each of the photons, instead of for only one (as suggested in the last-but-one para), we arrive at the true relative v speed of the two objects as $(v_1+v_2)/(v_1+v_2) = 1$ always. Thus the true relative speed always turns out to be unity for any objects--not necessarily only for photons.

(19) D.B.L.: The time component of speed always includes the time of the progression (clock time), regardless of whether the moving objects are, like the photons, moving at the unit speed of the progression, or at some different rate. Thus the denominator is always $1 \pm v$, never v alone.

(20) K.V.K.: p. 128-9, NBM: It is not clear why the relation that "..a magnetic displacement n is equivalent to $2n^2$ electric displacement units" does not hold good for n=1. For n = 1, the equivalent electric displacement works out to be 2, by this formula. However, in the development of the series of elements, the magnetic displacement 1 is counted as an equivalent electric displacement of 1 unit and not 2. There is definitely a hiatus in the reasoning here, an examination of which may lead to some important insight and clarify, among others, the case of half units represented in M ½-½-0, for example.

ward relative to the natural reference system. The apparent progression of the natural reference system is therefore outward.

Under these circumstances, it is not difficult to see that halving the displacement unit amounts to taking the square-root of the corresponding speed and does not involve any half unit of speed (i.e., if d = lg n, then ½d = ½ lg n = lg $\sqrt{n}$). unit level, as in the case of sub-atomic particles, this gives rise to the unique possibility of positing ½ unit displacement (p. 141, NBM) because of the idempotent nature of unity (i.e., $\sqrt{1}$ = 1), without involving anything less than unit speed.

(20) D.B.L.: I don't believe that I get the point of your argument on this item. So far as I can see, we are applying the same relation all the way through the series of elements. The sequence of magnetic additions is this:

	Rotation	Net Speed	Electric Equiv.	
Rotational base (2)	1-0-0	0-0-0	0	
Effective zero (unity)	1-1-0	1-0-0	0	) n = 1
Helium	2-1-0	1-1-0	2	)
Neon	2-2-0	2-1-0	10	) n = 2
Argon	3-2-0	2-2-0	18	)

We start with a rotational base for each of the two rotating systems of the atom, with net speed zero in all dimensions. Then we add one magnetic rotational unit to bring the effective speed to unity, the natural zero level. (The language that I used in the book may have been somewhat misleading, although I did say specifically that the purpose of this first magnetic unit is to bring the scalar speed to zero on the natural basis.) Since this non-effective unit uses up one of the n = 1 spots, there is only 2 x 1^2 group of elements, and a 2 x 2^2 group follows, as shown in the tabulation.

(21) K.V.K.: p. 154, NBM: The inter-regional ratio is calculated on the basis that ".. for each of the 128 possible rotational positions there is an additional 2/9 vibrational position.." The ratio is thus found to be 128(1+2/9) = 156.44. However, in the case of sub-atomic particles, which are single rotating systems, only one, and not two, of the possible nine vibrational positions are occupied. Thus the inter-regional ratio must be 128(1+1/9) = 142.22 and not 156.44.

(21) D.B.L.: You are correct. The 142.22 ratio must be substituted for 156.44 in the appropriate applications. I said this on page 163 M.

This completes the items that I received from Professor Meyer. I have tried to be responsive to the questions that you have asked, but it cannot be expected that all of my answers will be satisfactory. So I want to assure you that I will be glad to discuss any of them at more length if there are issues that you want to raise. It is apparent from your comments that you have gained a good deal of insight into the structure of the theory already, and I would like to help clear away any obstacles that still remain in the way of a full understanding.

It has become quite clear since publication of Nothing But Motion that the scientific community in general has

very little comprehension of the scalar type of motion that plays such a large part in my theoretical development, although scalar motion is not something that is peculiar to my theoretical system. It is something that exists as one of the phenomena of the physical universe, and any physical theory should be prepared to deal with it. Since it is a very important factor in my theoretical structure, and so generally neglected in current practice, I am planning on including an extended discussion of this type of motion in Volume II. I put a part of this discussion into a memorandum that I used at the recent NSA conference at Huntsville, Alabama. I believe that this should be of some interest to you, and I am therefore enclosing a copy.

FURTHER COMMENT

K.V.K.: While printing my questions + DBL's answers, please consider the following additional remarks. The numbers I attached to these remarks below are those corresponding to my question numbers. The paragraphs numbered 5, 17 and 19 below may be printed in parentheses after the corresponding answers of DBL.

(5) Apparently, my question was not clear here. What I meant was: a progressing sine wave has two components--(i) the oscillation in the lateral dimension and (ii) the uniform forward progression. Now my point is, that both these components must be of the same nature--either spatial or temporal. Thus, if the oscillation component is in time, the progression component in the perpendicular dimension to be compounded with this has to be in time also; and the sine wave must be envisaged as occurring in three-dimensional time and not in three-dimensional space.

(15) My query No. (15) becomes partly redundant if my paper on c-atom lifetimes appears in RECIPROCITY. As much, only the first para of my query No. (15) may be retained--in order to give continuity Larson's answer No. (15)--and the rest could be omitted. (See p.)

(17) But reply No. (17) does not answer the point I raised here. I was asking whether this "coupled vibration," with speed of -1 like the gravitational motion, could be realized in some physical entity?

(19) Does the answer here mean that the relative speed of two objects with speeds v_1 and v_2 (in natural units) is given by $(v_1 + v_2)/(1 + v_1 + v_2)$ since the total time involved would be $(1 + v_1 + v_2)$?

THE LEVELS OF EXISTENTS: A REVIEW OF DOUGLAS HOFSTADTER'S BOOK GÖDEL, ESCHER, BACH: AN ETERNAL GOLDEN BRAID[1]

by
Ronald W. Satz

Introduction

The major topics of Hofstadter's book are metamathematics, human brain operation, and artificial intelligence. The first part of the book is called GEB (Gödel, Escher, Bach) and the second part of the book is called EGB (an Eternal Golden Braid). The book is 777 pages long, including an 18 page index. There are 152 figures. As might be expected of a best-seller and Pulitzer Prize winner, the book is written in a very popular, even jocular, style. Though huge and sprawling, it is very entertaining and stimulating.

Douglas Hofstadter (hereafter abbreviated to D.H.) is Assistant Professor of Computer Science at Indiana University and is apparently going to take over Martin Gardner's column in Scientific American. D.H. describes himself as a "tortoise": "an ingenious, persistent, and humorous being, with a fondness for paradox and contradiction." His humor comes through in the between-chapter metaphorical dialogues, which are roughly patterned after Bach's fugues. Paradoxes and self-references are discussed in all the sciences. Even the title of the book is parodied to Copper, Silver, Gold: an Indestructible Metallic Alloy (a book on metal-logic). The end of the book includes its own self-reference.

To do justice in commenting on the book would itself require a book. But to keep this review short, I will be content only to mention briefly some of the hundreds of topics discussed and will point out where I disagree with D.H. Even though the book generally progresses from metamathematics to artificial intelligence it is not a systematic presentation of the levels of existents; individual chapters may have a complete mixing of levels. In this review, I will discuss one level at a time, starting at the lowest and ending with the highest.

I. Logic and Mathematical Science

A. Formal systems

D.H. discusses formal systems of logic and mathematics. To specify a formal system requires the following: an alphabet of symbols, a set of finite strings of these symbols (called well-formed formulas), a set of axioms, and a finite set of rules of deduction. First, D.H. gives some very elementary examples of formal systems of his own invention: the MIU system, the pq-system, and the TQ-system. Then he goes on to discuss a non-axiomatic version of the Propositional Calculus (I prefer the axiomatic version; see Ref. 2 by A. G. Hamilton). Topics discussed include the alphabet, rule of joining, well-formed strings, atoms, formation rules, rule of separation, double-tilde rule, deduction theorem (called, oddly, by D.H., "the fantasy rule"), carry over rule, intended interpretation, rule

of detachment, contra-positive rule, De Morgan's rule, "switeroo" rule, and decision procedure for theorems (truth tables). D.H. does not discuss the Predicate Calculus.

Next, D.H. addresses formal systems in mathematics, specifically geometry and number theory. He recites the history and postulates of Euclidean and non-Euclidean geometry. Then he presents a formal system of number theory, called "Typographical Number Theory" (abbreviated to TNT). This includes numerals, variables, terms, atoms, negations, compounds, quantifications, open formulas, closed formulas, 5 axioms, rule of specification, rule of generalization, rules of equality and successorship, and the rule of mathematical induction. There is mention of recursive and primitive recursive functions and graphs, but here is no mention of non-recursive functions. I think that this is a profound omission, as shown next.

B. Results about formal systems

A consistent formal system is one in which every theorem, upon interpretation, comes out true (in some imaginable world); a complete formal system is one in which all true statements can be expressed as theorems. Now Ref. 2 shows that the Propositional Calculus, pure first order Predicate Calculus, first order theory of Abelian groups, and first order arithmetic without multiplication are all consistent and complete. The major question handled by D.H. is whether Typographical Number Theory is consistent and complete--and many pages are devoted to showing that if it is consistent, then it is incomplete. D.H. gives many variants of Gödel's Incompleteness theorem, one of which is

> All consistent axiomatic formulations of number theory include undecidable propositions.

Perhaps most readers will accept this at face value and may even revel in this impotence as D.H. seems to. However, the statement is wrong! TNT and similar systems are incomplete, but it is wrong to say that no consistent formal system of arithmetic can be complete. In fact, to quote from Ref. 2, p. 151, "If we allow our sets of proper axioms to be non-recursive, we can have a first order system of arithmetic which is consistent and complete." The problem with TNT is that it represents only recursive functions and not non-recursive functions.

But how useful is a formal system of number theory based on a set of axioms which are not recursive? If Church's thesis is correct, the answer is: not useful. D.H. gives 8 different versions of the thesis, none of which I particularly care for. A version I like is given in Ref. 2, p. 155:

> Church's thesis is equivalent to the conjunction of
> (i) Every partial function computable by algorithm is a recursive partial function.
> (ii) Every recursive partial function is computable by algorithm.

Statement (ii) can be demonstrated, but statement (i) cannot be. Therefore from the conclusion that a particular function is not recursive, we can deduce that no algorithm exists only if we assume Church's thesis. Thus there is still some hope that a complete, consistent, and useful formal system of number theory can be constructed. Like so many previous commentators on Gödel's theorem, D.H. is wrong.

II. Meta-physical Science

A. Holism vs. reductionism

D.H. excellently presents the arguments for and against holism and reductionism. As I see it, there are three stages to knowledge. Most people remain in the first stage, which I call "naive holism," in which they view practically all objects in their environment as "wholes"; they know the inputs and outputs of a given existent, but they do not know the in-between steps of processing. D.H. spends quite a few pages on Zen Buddhists--people I consider to be naive holists. The second stage of knowledge is "scientific reductionism." Here, a scientist studies a given existent, breaking it down into lower-level existents. Ad hoc theories are formulated for the given existent. The overall result of scientific reductionism is a collection of theories--most of which do not fit together well--for all the different disciplines. The third and final stage of knowledge is reached upon the development and understanding of a unified, general theory covering all levels of existents. I call this "sophisticated holism." This is the sort of theoretical system that Larson, I, and other members of our group are working on. Whereas D.H. maintains that a formal system cannot lead to all truths, I believe that a sufficiently powerful one could.

B. Supernaturalism, atheistic materialism, transnaturalism

Most people are supernaturalists: they believe that a being or realm exists which cannot be described by natural law and which is the origin of all natural phenomena. Most scientists--including D.H.--take the stand of agnostic or atheistic materialism: all that exists are matter particles in space-time; there is no ESP and no souls. Another position that Larson, I, and some others like, but which is not discussed by D.H., is that of transnaturalism: the belief that another natural (but non-physical) realm exists, which is the source of ethical law (and perhaps ESP). By no means is this a magical or occult realm. D.H. seems to think that animals, humans, and machines are very much alike--he ignores the ethical distinction of humans.

III. Physical Science

A. Non-chunked laws

D.H. only briefly mentions the theories of relativity and quantum mechanics; his main interest is in particle theory. Here he talks about quarks, electrons, positrons, photons, Feynman

diagrams, phonons, polarons, nuclei, and virtual particles. He says that "Every real particle's existence involves the existence of infinitely many other particles, contained in a virtual 'cloud' which surrounds it as it propagates." I totally disagree! Needless to say, D.H. is unaware of the Reciprocal System.

B. Chunked laws

However, D.H. excellently discusses macroscopic laws of physics, such as the gas laws, Ohm's law, and the principles of meteorology. These laws are extremely useful to us since a description at the molecular level would be tremendously difficult; for example, have you ever tried to explain the weather in terms of the positions and motions of individual molecules of the gases in the air?

IV. Biological Science

A. Sub-cells

D.H. maintains (without going into detail) that life arose by some "bootstrapping" process from physical matter. He discusses self-assembling viruses and non-self-assembling viruses. And he humorously describes how a T4 bacteriophage "rapes" an E. Coli. bacterium.

B. Cells

There isn't much discussion of how the organelles of the cell came together. But D.H. goes through the usual identification of the nucleus and the cytoplasm and presents the central dogma of molecular biology: DNA ⇨ RNA ⇨ proteins.

D.H.'s main interest here is in cellular reproduction. Among the topics discussed: DNA strands, bases, enzymes, copy modes, amino acids, translation, the structure of enzymes (primary, secondary, tertiary, and quarternary), punctuation, genes, ribosomes, purines, pyrimdines, and levels of meaning in DNA. He presents a very clever "formal" system for replication, called "Typogenetics."

Multi-cellular organisms and populations of organisms are only briefly alluded to. But there is a good discussion of morphogenesis, feedback and feedforward loops, repressors and inducers, and the theory that differentiation is due to different sets of "working" proteins in different cells of a multicellular organism. D.H. does make the point that "cracking" the genetic code is only the beginning. We must eventually be able to look at the genotype and be able to deduce all manner of details of the phenotype.

One appropriate biological topic missing is the origin and evolution of nervous systems and brains.

D.H. only briefly mentions the theories of relativity and quantum mechanics; his main interest is in particle theory. Here he talks about quarks, electrons, positrons, photons, Feynman

V. Human Science

What is the nature of a human being? There seem to be three different views in the literature. One is that man is merely an animal, a member of the biological kingdom Animalia. The second view is that man is distinct enough from the animals, by reason of language and technology, to be placed in a separate kingdom. The third view goes even further; it maintains that man, by reason of his code of ethics, is as distinct from biological existents as biological existents are from physical existents. D.H. definitely takes the first view.

A. Psychology and brain physiology

There are 25 trillion cells in a human being, of which 10 billion are neurons. D.H. explains dendrites, axons, and synopses. He likens the collection of neurons to the collection of ants in an ant colony. He gives the operation of the neurons by paraphrasing Descartes' famous remark, "I think therefore I sum." The organization of the brain is shown: the cerebellum, the cerebrum, and the cerebral cortex. The two hemispheres of the cortex are only briefly described, and D.H. does not even allude to the verification of the psychological theory Transactional Analysis. (The rational, analytical, logical, reality-oriented Adult ego state of TA is generated from the left cerebral cortex; the fun-loving, intuitive, holistic, creative Child ego state of TA is generated from the right cerebral cortex; and the nurturing or critical Parent ego state of TA is generated by the remainder of the brain.)

D.H. next examines the location of memory. Lashley's experiments indicated that memory is not localized, whereas Penfield's experiments indicated that it was. D.H. resolves this contradiction by postulating that a particular memory is stored in a number of brain areas.

More complex cells than ordinary neurons may be involved in visual processing, such as "complex" cells, "hypercomplex" cells, and "ultrasuper-hyper-complex" cells ("Grandmother" cells--is he kidding?). The next level of complexity comes with a grouping of neurons, called a neural "module" or a "symbol." D.H. states the intriguing idea that a symbol is roughly something for which one knows a word or stock phrase. (He says, though, it may be difficult to disentangle symbols and identify which group of neurons is responsible for which word.) There is a symbol of the self, the "self-symbol" or "I." D.H. gives a non-soulist explanation of mind and seems to lean toward determinism instead of free will. The problem with a non-soulist explanation is that it has to account for the ethical code, which is difficult to do; on the other hand, a soulist has to explain exactly how a non-physical existent can interact with a biological existent, an equally difficult task. In any case, self-awareness and consciousness are an epiphenomena.

B. Music and art

D.H. believes that there are algorithms in the brain which give rise to creativity, including the making of art and music. He even says that there is an algorithm for the appreciation of beauty. At any rate, the book is heavily illustrated with the paintings of M. C. Escher, a Dutch graphic artist, noted for paradox, illusion, double-meaning, and strange loops-- a perfect match for Gödel and Bach.

V

C. Language and various paradoxes

D.H. takes very seriously the paradoxes in language. His favorite is the Epimenides paradox. (Epimenides was a Cretan who made one immortal remark: "All Cretans are liars.") Now some philosophers, particularly the logical positivists, think that such paradoxes are silly and meaningless; D.H. thinks that these philosophers are silly and meaningless. According to the logical positivists, any significant statement is a statement of form or a statement of content. Essentially all of the paradoxes listed by D.H. are statements of both form and content. D.H. seems to relish such paradoxical statements. He does not relish the resolution of these paradoxes. I do.

D. Sociology, economics, political science

Not much is said on these topics (but the ideological battle between libertarianism and communism is alluded to). D.H. does find "strange loops" in government, for example, the FBI investigating its own wrong-doings. However, proper interpretation of the Constitution should resolve such problems.

By the way, D.H. points out, changes or advances in number theory will have no affect on the calculations of bankers!

E. Technology

Technology is the result of purposeful interaction between human existents and physical existents (engineering) and between human existents and biological existents (genetic engineering, agriculture, and medicine). D.H.'s main interest in this area is in computer systems and artificial intelligence.

1. Computer systems

D.H. gives the usual description of computer systems, including the following: memory, central processing unit, input-output devices, bits, micro-programming, machine language, assembly language, high-level languages, compilers, and interpreters. He discusses his three computer programs: BlooP, FlooP, and the mystical GlooP and discusses modularity, loops, and procedures in programming.

2. Artificial intelligence

The goal of the AI community is to construct a machine which will have self-modifiable software or the base of

inviolate hardware. D.H. lists the achievements of AI to date: mechanical translation, game playing, proving mathematical theorems, symbolic manipulation of mathematical expressions, pattern recognition, hearing, understanding natural language, producing natural language, and learning (in a small way). D.H. may be pessimistic about formal systems but he is certainly optimistic about the future potential of AI. He says that future AI products could have superintelligence, a will, creativity, and appreciation of beauty. Of course, with each new advance we humans are likely to become blase (Tesler's theorem on AI). Well, I do hope that AI workers come up with a super-intelligent theorem deducer, one that, say, could take the axioms of the Reciprocal System and continuously print out in English their step-by-step consequences (theorems). But many decades could pass before we have such a machine.

References:

1. Douglas R. Hofstadter, Gödel, Escher, Bach: an Eternal Golden Braid (New York: Vintage Books, 1980).

2. Alan C. Hamilton, Logic for Mathematicians (Cambridge: Cambridge University Press, 1978).

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MORE ABOUT 1981 NSA CONVENTION

The DEI Room, where our 1981 CONVENTION will be held, contains a full scale mock-up of the Shuttle, Columbia. One of the original Apollo capsules is also kept there as well as many other displays associated with space exploration. This should provide a good environment for the CONVENTION.

It is possible that a Rockwell Public Relations speaker will be sent to our meeting to describe the Shuttle program and its associated future projections. The time of this presentation has not been established, but is tentatively scheduled after lunch Friday.

Access arrangements to the DEI Room for attendees who are not Rockwell employees will be detailed to you later. A request has been submitted to allow attendees to eat lunch at the Rockwell cafeteria at noon on Friday. This will give attendees a choice of food and help to keep cost at a minimum. No special lunch time program is being planned.

CALL FOR PAPERS. An NSA member or a person who becomes an NSA member (annual membership dues $10 payable to NSA Treasurer Rainer Huck, address on page 2) is eligible to submit a paper to be considered for presentation to the 1981 CONVENTION. Anyone eligible who wishes to present evidence supporting and/or critically analyzing some aspect of the Reciprocal System of Physical Theory is invited and encouraged to apply to present a paper to the August meeting by submitting abstract, including author's name and address, title of paper, time requested and aids, if any, needed by July 8th to Dr. Rainer Huck, Program Organizer. Notice of acceptance of submitted paper will be sent to author by July 22.

GRAVITATIONAL DEFLECTION OF LIGHT BEAM IN THE RECIPROCAL SYSTEM

by
K. V. K. Nehru

The gravitational deflection of light beam owes its origin to the same factor as that causing the excess perihelion precession of the planets--namely, the coordinate time component associated with independent motion [1]. But there is a significant difference between the movement of a planet and the movement of a photon in the sun's gravitational field. In the former case, the motion of the planet is an independent motion. On the other hand, the motion of the photon is due to the background space-time progression and is introduced by our use of the stationary reference system. This has an important bearing on the manner in which the spatial effect of the coordinate time manifests itself in the motion, in the two cases, as will be explained below.

Gravitational Motion and the Gravitational Potential

The gravitational motion of a material atom is inward in space. But in a celestial object like a star, which is a spatial aggregate of such units, the inward motion of each unit is counterbalanced by the interaction with the contiguous neighbors. The scalar space-time direction of this counterbalancing force is in opposition to that of gravity and has the same magnitude as the gravitational motion and is equal to the escape velocity, v, at that location. The escape velocity can be evaluated by noting that the centrifugal force on a mass m situated at a radial distance r will be equal to the gravitational force on it by the central mass M. Thus

$$m \frac{v^2}{r} = G \frac{Mm}{r^2} \quad \text{or,} \quad v^2 = \frac{GM}{r} \qquad (1)$$

where G is the gravitational constant.

Coordinate Time

The coordinate time increase associated with a speed v is given by

$$\frac{v^2}{c^2} \text{ fraction of unit/unit} \qquad (2)$$

This is in the radial direction of the counterbalancing force explained in the para above [2].

Let the radial distance of the photon at its closest approach to the sun by r_o. Since v^2 is a point function of the radial distance given by eq. (1), the increase in the coordinate time for a change of radial distance from the 'outer gravitational limit' [3] to r_o will be given by

$$\tau_{g-o} = (v_o^2/c^2 - 0) = v_o^2/c^2 \qquad (3)$$

where $v_o^2 = GM/r_o$. The circumferential space equivalent [2] of this coordinate time increase is $\pi v_o^2/c^2$. But the photon is already moving at unit speed--one unit of space per unit of time--in the forward dimension. As such no further spatial shift is possible in the direction of its motion (unlike in the case of the planetary motion). However, in view of its scalar nature, the spatial effect of this coordinate time increase will manifest in a spatial dimension other than the one in which the photon is already progressing at unit speed. Thus the photon gets displaced in the inward radial direction coinciding with the direction of gravity.

Now the question arises why this effect should manifest radially inward instead of radially outward direction. The situation here can be easily understood if we look to an analogy from the motoring/generation principle in electrical engineering. Current flowing in a particular direction, in the conductor of a motor armature situated in a magnetic field forces the armature to rotate. But the rotation of the conductor (in the same magnetic field) now generates what we call the 'back e.m.f.' and causes a current flow in the conductor in the opposite direction (opposing the original current), establishing a natural equilibrium. Analogously, in the present case, the coordinate time increase resulting from a radially outward equilibrium motion manifests as a circumferential spatial shift. While this gives rise to the excess perihelion motion in the case of orbitting planets, in the case of the photon such motion not being possible, the spatial shift, $\pi v_o^2/c^2$, shows up in the radial direction opposite to that of the originating motion: that is, it manifests in the radially inward direction.

We have so far considered the increase in coordinate time only during half of the transit, from the outer gravitational limit to r_o. The coordinate time change associated with the remaining journey, from r_o onwards to the outer gravitational limit on the other side, will similarly be

$$\tau_{o-g} = (0 - v_o^2/c^2 = - v_o^2/c^2 \qquad (4)$$

This will again manifest as a spatial shift of magnitude $\pi v_o^2/c^2$. It must be noted that the negative sign of the coordinate time increase, in eq. (4) above, has no relevance in deciding the direction of its spatial effect. The spatial effect is always additive, irrespective of the sign of the coordinate time because of the scalar nature of the relation between the dimensions of time and the dimensions of space. Thus the total spatial shift in the direction perpendicular to that of progression is given by

$$\delta_o = 2\pi v_o^2/c^2 \qquad (5)$$

in fraction of unit/unit or simply the deflection in radians.

Interaction Cross-section

However, this deflection, given by eq. (5) is not necessarily effective in its entirety. This requires the consideration of the way in which an independent motion, as against the fictitious motion of the space-time progression, can be brought to bear on a photon or a material particle. An independent motion can be imparted to a

material atom, for example, because it can offer a resistance in the direction of the motion being applied. The resistance to motion is due to the speed displacement in that dimension. For instance, why we don't find sub-atomic particles participating in the scalar inversion from the cosmic-sector to the material sector, giving us the cosmic rays, is because they are unable to build up speed in the vacant dimension in which they do not have any displacement. In contradistinction, the motion of the space-time progression applies in the vacant dimension, as in the case of a photon, for example.

As such, in the present case, the full force of the deflection motion is applicable to the photon only if the plane of vibration of the photon is parallel to the deflection motion: that is, if it is in the direction of the gravity.

Let us take a look at the photon in the direction of its progression. Referring to the figure, let the direction perpendicular to the plane of the paper represent the direction of the photon progression. The diameter of the circle is one natural unit of space representing the amplitude of the photon vibration. Any diameter of the circle, like PP, now represents the plane of vibration of the photon (looking end-on). OD is the direction of the deflection motion. Suppose the photon vibration happens to be in the YD direction, the full impact of the deflection motion, δ_o, can be imparted to it. On the other hand, if the plane of vibration is XB, since the photon does not carry any displacement in the YD direction, none of the deflection motion can be imparted to the photon. In fact, when the plane is tilted at an angle φ to YD, the fraction of the deflection motion that can be transferred to the photon is proportional to $\cos\varphi$.

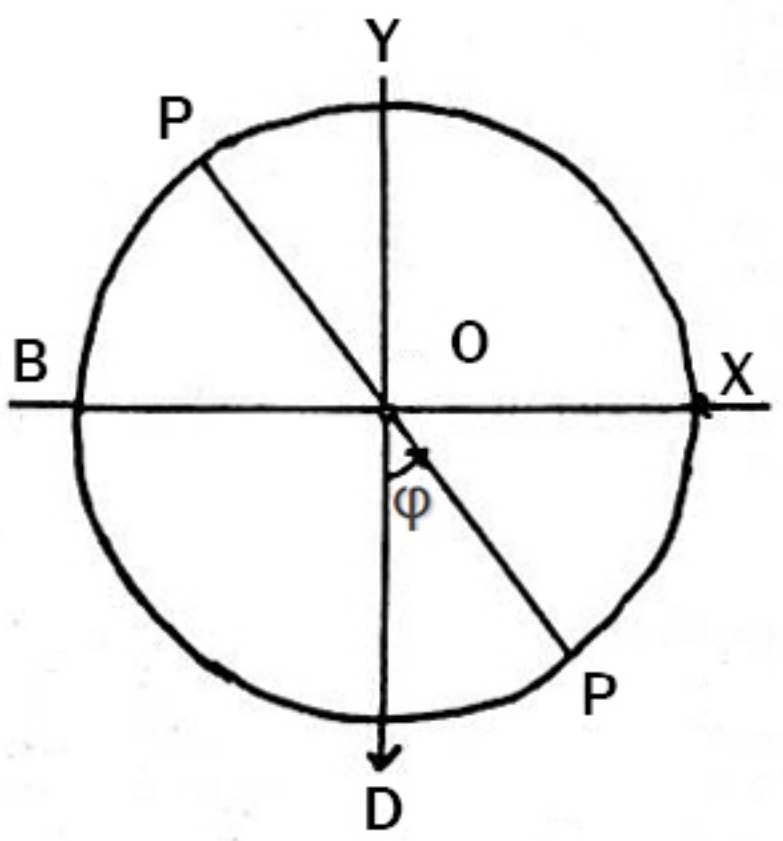

Fig. 1

In an unpolarized beam all orientations are equally existent and the average value of the resistance--which I will call the 'interaction cross-section'--that makes the motion transfer possible can be obtained by

$$\sigma = \frac{\int_{-\frac{1}{2}\pi}^{\frac{1}{2}\pi} \cos\varphi \, d\varphi}{\left(\frac{1}{2}\pi - \left(-\frac{1}{2}\pi\right)\right)} = \frac{2}{\pi} \qquad (6)$$

So finally, from eqs. (5) ε (6), the total effective deflection is

$$\delta = (2\pi v_o^2/c^2).(2/\pi) = 4v_o^2/c^2 \qquad (7)$$

Or, using eq. (1), we have

$$\delta = 4\frac{GM}{r_o c^2} \tag{8}$$

Polarized Beam

It may be noted that the above result is identical to what The General Relativity predicts. However, the result differs from the Relativity value in the case of polarized beam of radiation. Consider the case of a fully polarized beam. Let the plane of polarization be represented by PP (fig. 1), inclined at angle ϕ to the direction of gravity, YD. From what has been said above, the total effective gravitational deflection will be

$$\delta_p = \frac{2\pi v^2}{c^2} \cos \phi = 2\pi \frac{GM}{r_o c^2} \cos \phi \tag{9}$$

In the more general case where the degree of polarization in each direction varies, we proceed as follows. Let the power p in any plane (of polarization) be a function of the tilt angle ϕ:

$$p = p(\phi) .$$

Then the average interaction cross-section is given by

$$\sigma_p = \frac{\int_{-\frac{1}{2}\pi}^{\frac{1}{2}\pi} p(\phi) \cos \phi \, d\phi}{\int_{-\frac{1}{2}\pi}^{\frac{1}{2}\pi} p(\phi) \, d\phi} \tag{10}$$

The total effective deflection, then, is

$$\delta_p = \delta_o \cdot \sigma_p$$

This aspect of the theory, namely, the dependence of the gravitational deflection on the polarization characteristics of the traversing beam provides a possibility to observationally test it in comparison with the theory of Relativity.

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REFERENCES

1. Larson, Dewey B., Nothing But Motion, North Pacific Pub., Portland, Oregon, 1979, p. 99-100.

2. Larson, Dewey B., Beyond Newton, North Pacific Pub., Portland, Oregon, 1964, p. 126.

3. Larson, Dewey B., Quasars and Pulsars, North Pacific Pub., Portland, Portland, Oregon, 1971, p. 166.

GRAVITATIONAL REDSHIFT ACCORDING TO THE RECIPROCAL SYSTEM

by
Dr. K. V. K. Nehru

If the frequency of a photon is f', at a location where the gravitational potential is GM/r, then according to Relativity the gravitational redshift is given by

$$z_g = \frac{f' - f}{f} = -\frac{GM}{rc^2} \qquad (1)$$

where f = frequency of the radiation in its inertial rest frame,
G = gravitational constant,
M = mass of the object,
r = radial distance of the photon,
and c = speed of light.

The account of the gravitational redshift in the Reciprocal System may be given as follows:

The gravitational motion of any material particle is inward in space, toward all other space-time locations. In a celestial object such as a star, which is an aggregate of such material units, this scalar inward motion of the individual units is counterbalanced by the physical continguity of the neighboring units. This counterbalancing force is in the scalar direction of the space-time progression, being opposite to gravity, and has the same magnitude as that of the gravitational motion at that location. Thus its measure is equal to the escape velocity, v. Now, we can identify the coordinate time increase at a particular location to be v^2/c^2 (in fraction of units/unit), just like in the case of excess perihelion shift. This means that the total time involved per unit of clock-time is $[1 + (v^2/c^2)]$ units. The frequency, f, denotes the number of oscillations per unit of time in a gravity-free situation. In the location under gravity, then, this frequency becomes f number of oscillations per $[1 + (v^2/c^2)]$ units of time. Thus

$$f' = \frac{f}{1 + v^2/c^2}, \text{ or } \frac{f'}{f} = 1/[1 + (v^2/c^2)] \qquad (2)$$

Therefore, the redshift is $z_g = \frac{f'}{f} - 1 = -(v^2/c^2)/[1 + (v^2/c^2)]$ (3)

Comparison of the Results of the Two Theories

The escape velocity, v, is evaluated as follows: The centrifugal force on a mass m rotating at the orbital speed of v at radius r is equal to the gravitational force by the central mass M, under equilibrium situation. Thus

$$m\frac{v^2}{r} = G\frac{Mm}{r^2}, \text{ i.e., } v^2 = \frac{GM}{r} \qquad (4)$$

Substituting this in eq (1) and rearranging, we have, according to Relativity,

$$f'/f = 1 - (v^2/c^2) \qquad (5)$$

Comparing this with eq (2) we can see that $1 - \frac{v^2}{c^2} \approx (1 + \frac{v^2}{c^2})^{-1}$ for small values of v. The divergence between them can be detected only (i) if the present experimental accuracies can be improved by many orders of magnitude, or (ii) if the test could be carried out for extremely large gravitational potentials such as encountered in the white dwarfs etc.

PRESIDENT'S COLUMN

Friends of the Reciprocal System know that it is in the mainstream of physics and science. There is some reason to think that this fact is somewhat obscured by action of our corporation. If so, the action contradicts our main overt purpose, which is to promote the Reciprocal System as effectively as we can. The action consists of retention hitherto of the name of our corporation, NEW SCIENCE ADVOCATES, adopted from its beginning. The term 'NEW' is easily misinterpreted. Do we advocate replacing the developed science of physics with the Reciprocal System? Of course NOT! The Reciprocal System is the developed science of physics, revalued and unified. To consider corporation name change I appointed a Committee, headed by Phil Porter, at our 1980 Huntsville Convention. The question of a better name for our corporation should be examined further by all of us at the 1981 Los Angeles Convention. Please send your thoughts to Phil Porter, P. O. Box 382, Loveland, CO 80537.

The most potent influence bringing and keeping us together in our incorporated existence is RECIPROCITY, our news organ. Improvement of its format and content, increase of its circulation and subsidizing its production are matters requiring our best intelligence at the coming 1981 Los Angeles Convention. To initiate consideration of these matters I appointed a committee, headed by Brad Elkin, at our 1980 Huntsville Convention. Please send your thoughts to Brad Elkin, 311 A Town Building, University of Pennsylvania, PA 19104. Toward transforming RECIPROCITY from an 11 year-young science newsletter to a full-size journal or combination of newsletter and journal, I have appointed two lively recent recruits, Mr. Jan Sammer of Princeton, N.J. and Dr. K.V.K. Nehru of Hyderabad, India, to enlarge the RECIPROCITY editorial staff.

Members and friends of the non-profit corporation to promote the Reciprocal System should know that all of us owe much to some facilities of the University of Wisconsin-Superior, which aided the publication of RECIPROCITY and my own studies of the Reciprocal System of physical theory during the past decade. Since I am retiring from my teaching position at this University May, 1981, I wish publicly to thank particularly Mary Jo Gangnon and Barbara Johnson, excellent transcribers of past and present issues of RECIPROCITY, Katherine Munson for aid with label preparation, Marcella Typpo for aid with mailing, Dean Egal Feldman and Dr. Ronald Roubal for moral and material support.

I look forward again to seeing many of you in Los Angeles in August.

LIFETIMES OF C-ATOM DECAYS

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[All references from 'Nothing But Motion' are designated as NBM, and from 'New Light on Space and Time' as NST.]

The phenomenon of the entry of c-matter into the material sector or the analogous entry of matter into the cosmic sector, involving the passage from space-time domain to time-space domain, may be called 'scalar inversion' to emphasize the nature of the alteration of the reference frame. Scalar inversion involves two things: firstly., a transformation of motion in time (or space) to motion in space (or time), through the unit speed boundary, in all the three dimensions. Secondly, the emergence of a c-atom, for example, into the material sector can take place only from inside a single unit, since the three dimensions of time have nothing in common with the three dimensions of space--both having not more than a point contact, as it were (p. 154, NBM).

Therefore, in following up the calculation of various quantities across the boundary in scalar inversion, from the cosmic sector to the material sector, for example, consideration must be given to: (i) the loss of dimensional 'information' during the alteration of the viewpoint from the temporal reference frame to the spatial reference frame and (ii) the space equivalent of time occurring within a single unit.

As a result of the first point above, it is known that the full influence of spatial (or temporal) effects does not get transmitted across the boundary except when it involves only one dimension. On the other hand, only a fraction $1/c$ in the case of two-dimensional effects, and a fraction $1/c^2$ in the case of three-dimensional effects gets transmitted. (See p. 185, NST.) I will refer to this as criterion No. II in the sequel.

Regarding the second point above, namely, concerning the relation between quantities within the outside single unit, "..The time region speed, and all quantities derived therefrom, which means all of the physical phenomena of the inside region...are ... second power expressions of the corresponding quantities of the outside region." (p. 155, NBM) I will refer to this as criterion No. IV. In order to find the lifetimes of the cosmic atoms in the material environment it is necessary to apply both the above criteria.

The first step in deriving the lifetimes is to recognize that, in view of the scalar inversion, the spatial extension of the c-atom, being the analog of the lifetime in material sector, bears a relationship to the latter. As such we start with the consideration of the spatial extension of the incoming c-atom. Now, scalar inversion is not possible with anything more than one unit in each dimension. Depending on the number of dimensions of the motion eventually acquired during the inversion process, the amount of space involved in the one, two and three-dimensional cases is respectively s, s^2

and s^3 (where s is the unit space expressed in the c.g.s. system). Let us refer to this as criterion No. I.

The remaining criterion, No. III, necessary for our calculation is the recognition of the fact that the temporal equivalent of a spatial extension s across the inversion boundary is s/c (where c, the unit speed, is expressed in the c.g.s. system). The result of applying the above four criteria to the one, two and three-dimensional situations is given in the following table.

Criterion No.	Number of Dimensions		
	1	2	3
I	s	s^2	s^3
II	s	s^2/c	s^3/c^2
III	s/c	$(s^2/c)(1/c)$	$(s^3/c^2)(1/c)$
IV	$(s/c)^{\frac{1}{2}}$	$[(s^2/c)(1/c)]^{\frac{1}{2}}$	$[(s^3/c^2)(1/c)]^{\frac{1}{2}}$
Result Converted to secs.	1.233×10^{-8}	1.521×10^{-16}	1.875×10^{-24}

The same result could have been obtained more simply though showing less details of the underlying process by directly noting that the clock-time involved in the one, two and three-dimensional cases of the decay is t, t^2 and t^3 respectively (where t_o is the unit time expressed in the c.g.s. system). The measured values of the lifetimes could then be obtained by applying the criterion No. IV, as $t^{\frac{1}{2}}$, $(t^2)^{\frac{1}{2}}$ and $(t^3)^{\frac{1}{2}}$ respectively.

Further, in the calculations above if the extension space involved is taken as $\frac{\pi}{4}s^2$ and $\frac{\pi}{6}s^3$ respectively in the two and three-dimensional cases, basing on symmetrical probability, instead of s^2 and s^3, we have the computed values of the lifetimes in the respective situations as 1.348×10^{-16} and 1.357×10^{-24} secs.

The acquisition of gravitational charges by the incoming c-atoms has an effect on the above lifetimes which can be evaluated in the following manner. In view of the scalar inversion, it must be noted that the gravitational charge of the material sector, being a two-dimensional rotational vibratory time displacement, is foreign to the space-time character of the basic rotational displacement of the c-atom. In the analogous case of a material atom, for example, a gravitational charge of the cosmic sector is tantamount to a magnetic charge in the material environment. Consequently, the calculation of the influence of a rotational vibration of space-time direction opposite to that of the basic rotation, on various quantities requires the consideration of the appropriate inter-regional ratio.

in the one, two and three-dimensional cases is respectively s, s^2

For example, "... the motion that constitutes the charge is on the far side of another regional boundary--another unit level--and is subject to ... inter-regional transmission factors." (p. 163, NBM). Further, "... inter-regional ratio ... accounts for the small "size" of atoms. According to the theory ..., there can be no physical distance less than one natural unit ... But ... the measured inter-atomic distance is reduced by the inter-regional ratio, and this measured value is therefore in the neighborhood of 10^{-8} cm." (p. 154-5, NBM). In exactly the same manner, the acquisition of a gravitational charge by the c-atom, in view of the inter-regional ratio, has the effect of shortening the measured lifetime by a factor of 1/156.44. (While it is clear that the inter-regional ratio operates here, I am not certain that its value is 156.44 in this case.)

An atom is a double rotating system. The rotational vibration that is a gravitational charge establishes a coupling with one of these two rotational systems. In the case of an acquisition of one more gravitational charge, the second rotational vibratory displacement acquired acts on the second rotational system of the c-atom rather than adding to the previous system already modified by the first gravitational charge. As such, the computation of the lifetime in this case involves the application of the inter-regional ratio once more. Thus the measured lifetime in the case of two gravitational charges acquired is shortened by a factor of $1/156.44^2$

The lifetimes, with or without the gravitational charges, in the one, two and three-dimensional situations are, therefore, as follows:

Dimensions	Charges	Lifetime (sec.)
1	0	1.233148×10^{-8}
1	1	0.788234×10^{-10}
2	0	1.520655×10^{-16}
2	2	0.621313×10^{-20}
3	0	1.875193×10^{-24}